ATTACHMENT - REMARKS

By this Amendment, independent claim 1 has been amended to better define the present invention in response to the newly cited reference, and new claims 42-45 have been added. It is submitted that the present application is in condition for immediate allowance for all of the following reasons.

Initially, it is noted that independent claim 29 and dependent claims 28 to 41 were indicated as being allowable. As a result, it will be appreciated that these claims are unchanged by this Amendment.

In addition, it is noted that new independent claim 42 contains the subject matter of allowable dependent claim 10, and thus claim 42 is now allowable. New dependent claim 43 is dependent from allowable claim 42, and it contains the allowable subject matter of dependent claim 11, so it is also now allowable. Further, new independent claim 44 contains the subject matter of allowable dependent claim 15, and thus is now allowable. Finally, new dependent claim 45, which is directed more closely to the embodiment of the figures, is dependent on amended independent claim 1 and is allowable for the same reasons as claim 1 as noted hereafter.

In the *Claim Rejections - 35 USC § 102 & § 103* sections, independent claim 1 and dependent claims 1-9 and 12-14 were rejected as being anticipated by, or obvious over the newly cited Oba *et al.* reference. However, for the following reasons, it is submitted that these claims as well as new claim 45 are all allowable over this reference.

In response to the above noted rejection over the newly cited Oba *et al.*, independent claim 1 has been amended to recite that when the strain sensing element is subjected to tension or compression at the load points that this compression or tension "urges the first and second load points towards or away from each other," and the portion that couples the first and second load points extends or bends, subjecting a first of the piezo-resistors to compression and a second of the piezo-resistors to tension.

Oba *et al.* make no reference to, nor in any way suggest, a stain gauge adapted to gauge strain applied in a manner that urges the load points towards or away from each other. Rather, the sensors of Oba *et al.* all comprise resistors coupled to a diaphragm portion of a silicon substrate, for sensing pressure applied perpendicularly to the diaphragm portion. Hence, unlike the present invention as presently defined in amended claim 1, the sensors of Oba *et al.* do not have first and second load points (but rather a single load region) and certainly do not disclose load points that are urged towards or away from each other under the monitored load.

There is simply no suggestion in Oba *et al.* of the configuration defined in amended claim 1, whereby, when the strain sensing element is subjected to tension or compression at the load points that urges the first and second load points towards or away from each other, the portion that couples the first and second load points extends or bends, simultaneously subjecting a first of a pair of piezo-resistors to compression and second to compression thereby inducing a change in the relative resistance of the pair of piezo-resistors.

It is submitted, therefore, that the present invention as now defined in amended claim 1 is novel and inventive over the disclosure of the newly cited Oba *et al* for the above noted and following more specific reasons.

In the Action, the Examiner refers to the embodiment of the figures 17A to 17C of Oba *et al.*, apparently the embodiment defined in claim 15 of that prior art document. According to Oba *et al.*, "the diffused resistor Ra' is located in a vicinity of a specific point where a positive change of the resistors is maximized, i.e., a specific point where the tensile strength is maximized. The diffused resistor Rb is located in the vicinity of the specific point where a negative change of the resistors is maximized, i.e., a specific point where the compressive strengthen is maximized" [see column 32 lines 23 to 29]. As discussed above, however, these criteria for the placement of resistors relates to pressure applied perpendicularly to the substrate, so it is by no means apparent how such an arrangement would respond when a load is applied "that urges the first and second load points towards or away from each other" as claimed. Indeed, examination of figure 17A suggests that any load applied at two different load points (being a load that would urge the load points towards or away from each other) would expose all the resistors either to compression or tension, as the resistors are aligned in parallel.

In the Action, the Examiner also draws the applicant's attention to claim 55 of Oba *et al.*, directed to the embodiment illustrated in figures 47 and 48 therein. That embodiment, again, is adapted for sensing pressure applied perpendicularly to diaphragm 503 (i.e., in direction N), where diaphragm 503 is provided within a silicone semiconductor substrate 501. This embodiment, however, relies on the provision of a deformable diaphragm 503 within an essentially rigid substrate 501, which is provided

by making diaphragm 503 much thinner than substrate 501. This makes the sensor of figures 47 and 48 sensitive to pressure applied in direction N, but not to pressures applied in the plane of substrate 501 that would urge load points (e.g., opposed, external walls of substrate 501) towards or away from each other.

In any event, this embodiment of the invention of Oba *et al.* operates in a fundamentally different way from that of the present invention, as may be seen from the explanation of figures 47 and 48 found at column 60 line 11 therein. The piezo-electric resistors of this embodiment are provided on a deformable diaphragm 503. The diaphragm 503 yields and hence stretches under pressure applied perpendicularly to its surface. Because the diaphragm stretches, the piezo-electric resistors are always subjected to tension, never to compression, because no portion of the diaphragm is compressed. The diaphragm simply stretches.

This embodiment of Oba *et al.* then relies on a particular property of the piezo-electric resistors to obtain a measure of the pressure applied to diaphragm 503. The voltage across each piezo-electric resistor is measured longitudinally. The different orientations of the piezo-electric resistors relative to the deformation of diaphragm 503, however, mean that the piezo-electric resistors of figures 47 and 48 are subjected to the aforementioned tension either longitudinally or laterally. Consequently, the applied tension will be either parallel to or perpendicular to the direction of measurement, producing a decrease or increase in measured resistance value respectively.

Thus, when diaphragm 503 of Oba *et al.* deforms in response to applied pressure in direction N, all four piezo-electric resistors 541, 542, 543, 544 of first bridge circuit 504 are subjected to the expansion of the diaphragm 503. That is, these four piezo-

electric resistors are all subjected exclusively to tension. However, this tension for resistors 542 and 544 is along the long axis of those resistors and hence parallel to the direction of measurement of their resistance, whereas the tension experienced by resistors 541 and 543 is in the direction of those resistors' short axis, so perpendicular to the direction of measurement of their resistance. The measured change of resistance will therefore be of opposite sign, and thus usable in a bridge circuit to obtain a measure of the applied pressure. Thus, the positive or negative resistance change arises from the alignment of measurement relative to tension, *not* (as in the present invention) from subjecting one resistor to tension and another simultaneously to compression.

Consequently, the embodiment of claim 55 (as exemplified in figures 47 and 48) of Oba *et al.* omits a number of features of claim 1 as amended. In particular, it does not include load points that are urged together or apart when the sensor is subjected to tension or compression. In addition, and most importantly, it does not include a first piezo-resistor that is subjected to compression and a second piezo-resistor simultaneously to tension in a manner that induces "a change in relative resistance of said pair of piezo-resistors" as claimed.

Therefore, for all of the foregoing reasons, it is submitted that amended independent claim 1 is neither disclosed nor made obvious by Oba *et al.* For these same reasons, it is submitted that dependent claims 2-9 and 12-14 as well as new claim 45 are also allowable over Oba *et al.*; and that dependent claims 10-11 and 15-28 having allowable subject matter are also now allowable.

The Examiner also refers to claim 55 of Oba *et al.* when discussing dependent claims 2, 3 and 6. However, claim 55 of Oba *et al.*, as discussed above, is directed to the embodiment of figures 47 and 48, and refers to concentric circles of the type clearly shown in those figures. These concentric circles, however, are not physical components of the sensor of figures 47 and 48, but rather are provided to indicate the relative alignment of piezo-resistors 541 to 544 and 551 to 554. The "strain sensing element" of sensor 501 is a "circular diaphragm 503" (see column 58 line 8), not the circles referred to in claim 55. Thus, Oba *et al.* discloses a circular member, but not an annular member and not a curved member. Claim 2 of the present application defines a "curved silicon member", claim 3 a "circular ring" or "annulus" (essentially synonyms), and claim 6 "a ring". None of these claims refer to a circle or circular member, and—it is submitted—are thus novel over Oba *et al.*

Nor can the shape of the "strain sensing element" be regarded as mere design choice. The tensile properties of circular diaphragm 503 of Oba *et al.* would change significantly if a ring-like or annular shaped sensor were employed, possibly impeding operation of the mechanism (discussed above) by which that embodiment works. The present invention, on the other hand, operates by a different mechanism so different shapes are required for optimal efficacy. It is by no means obvious from Oba *et al.* what the preferred shapes would be for the present invention. It is submitted, therefore, that dependent claims 2, 3 and 6 are additionally inventive over Oba *et al* for the above noted reasons.

The Examiner also cites Oba *et al.* against dependent claims 7 to 9. Claim 7 defines three load points, but—as discussed above—Oba *et al.* employ a single load

"region" comprising a deformable diaphragm. Comparable remarks apply to dependent claim 8 as well. It is submitted, therefore, that dependent claims 7 and 8 are additionally inventive over Oba *et al* for the above noted reasons.

Therefore, for all of the foregoing reasons, it is submitted that the present application is in condition for allowance and such action is solicited.

Respectfully submitted,

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